

WHAT IS CLAIMED IS:

1. A receiver for receiving a communication signal transmitted from a satellite, said signal including data information and synchronization information, said receiver comprising:
 - a phase estimator adapted to estimate a phase offset of said received signal;
 - a timing estimator adapted to estimate a timing offset of said received signal; and
 - a frequency estimator adapted to derive a frequency offset from said phase and timing offset by performing the following operations:
 - removing the modulation from the received signal;
 - sampling the received signal for information carrying data;
 - determining whether the step of sampling was done at a peak wave point of said data; and
 - repeating said step of sampling in a response to a determination that said sampling was not done at a peak wave point of said data.
2. The system of claim 1, wherein said synchronization information comprises a unique word.
3. The system of claim 2, wherein said unique word comprises between about ten to twenty symbols.
4. The system of claim 2, wherein said unique word comprises a known symbol arrangement between said satellite and said receiver.

5. The system of claim 2, wherein said unique word is used to derive said phase and timing offset.
6. The system of claim 1, wherein the process of determining said offset values comprises using a semi-aided data approach.
7. The system of claim 6, wherein said semi-aided data approach uses less bandwidth to transmit training information than a data-aided approach.
8. The system of claim 6, wherein said semi-aided data approach uses less time to determine synchronization information than a non-data-aided approach.
9. The system of claim 1, wherein removing said modulation comprises squaring the value of said received signal.
10. The system of claim 9, wherein said signal is delayed a half symbol.
11. The system of claim 10, wherein a subtraction is performed between the non-delayed and the delayed signal.
12. The system of claim 5, wherein said timing offset is used to adjust the sampling.
13. The system of claim 12, wherein the phase offset is used to adjust the phase.

14. The system of claim 1, wherein said phase and frequency offset is used to determine said frequency offset.

15. The system of claim 1, wherein said timing offset is redetermined by assuming said timing offset was off by a quarter of a symbol.

16. The system of claim 15, wherein said frequency derived from said original and redetermined timing offset is compared, said frequency giving better estimation is selected.

17. A method for receiving a communication signal comprising data information and synchronization information, said method comprising:

- receiving said communication signal at a receiver;
- determining a phase offset of said communication signal by processing the synchronization information;
- determining a timing offset of said communication signal by processing the synchronization information;
- removing modulation from said received communication signal;
- determining whether sampling was done at a peak wave point of said data; and

18. The method of claim 17, wherein said synchronization information comprises a unique word.

19. The method of claim 18, wherein said unique word comprises between about ten to twenty symbols.

20. The method of claim 18, wherein said unique word comprises a known symbol arrangement between said satellite and said receiver.

21. The method of claim 18, wherein said unique word is used to derive said phase and timing offset.

22. The method of claim 17, wherein the process of determining offset values comprises using a semi-aided data approach.

23. The method of claim 22 wherein said semi-aided data approach uses less bandwidth to transmit training information than a data-aided approach.

24. The method of claim 22, wherein said semi-aided data approach uses less time to determine synchronization information than a non-data-aided approach.

25. The method of claim 17, wherein removing said modulation comprises squaring the value of said received signal.